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ABSTRACT

Lexical development in mentally retarded and normal children was indexed using the Free Word Association Task. Approximately 170 institutionalized and noninstitutionalized retarded children and 59 normal children were administered the 40-word stimulus list consisting mainly of adjectives and nouns. Responses were categorized according to apparent relationship of response to stimulus word. Findings showed that lexical development proceeds from an idiosyncratic stage to a logical stage, with adjectives passing through an intermediate syntactic stage where selectional restrictions are learned. Lexical development of the retardates appeared to parallel that of normal children in terms of sequence, but was much slower. Data did not support the notion that institutionalization causes any delay in the development of language above and beyond any possible retardation of global MA. (Author/KW)

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Word Associations as Indices of Lexical Growth in Mentally Retarded Children

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April 1971

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Abstract

The free word association task was used to index lexical development in retarded and normal children. Approximately 170 retarded children, both institutionalized and non-institutionalized, along with 59 normal children, responded to a 40 word stimulus list consisting mainly of adjectives and nouns. Each response was categorized according to the apparent relationship between it and its stimulus word. Results indicated that lexical development proceeds from an idiosyncratic stage to a logical stage, with adjectives passing through an intermediate syntactic stage where selectional restrictions are learned. The lexical development of retardates appeared to parallel that of normal children with respect to sequence, but was considerably slower.

Word Associations as Indices of Lexical Growth in Mentally Retarded Children[1]

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When the work reported in this paper was begun, its goal was to compare the behavior of mentally retarded children in the Free Word Association Task (FWAT) with that of normal children. In particular, the focus was on shifts in the types of responses given as a function of increasing maturity. The expectation was that retarded children would display patterns as they matured (albeit slowly) which were similar in sequential development to the more rapidly changing word associations of normal children (abundently described in the literature). However, as the work progressed, a second goal emerged--to explain the behavior being observed both in the retardates and in the normal children. Again, the existing literature was helpful in providing several theoretical formulations which were generally compatible with the present orientation; however, it was found that some reformulation and elaboration was necessary.

The first section of this paper reviews the phenomenon of lexical growth (i.e., the acquisition of word meanings) in children and argues that the FWAT can be used to describe how word meanings are learned. Then the literature relating to the FWAT as an index of lexical growth is summarized both for normal and retarded children, and the present empirical work is outlined.

Lexical Development in Normal Children

McNeill's (1970) characterization of lexical development in normal children assumes that the adult version of the lexical entry for a word contains three sorts of information:

(a) a description of the sound pattern of the word.

(b) a set of markers indicating the syntactic properties of the word (i.e. what sorts of structures the word can appear in).

(c) a set of semantic markers representing the meaning of the word, these markers being either category labels or features (cf. e.g. Katz, 1965, for a more complete discussion of the notion "semantic marker").

McNeill hypothesizes that, since the child learns to speak in reasonably grammatical sentences by the time he is four or five years old, he evidently acquires both the sound pattern and basic syntactic characteristics of words fairly rapidly; however, McNeill offers several pieces of evidence to indicate that semantic information may accrue to the lexical entry of a word relatively slowly (for example, see McNeill, 1965; Chomsky, 1969). Evidence from previous studies of the FWAT would seem to confirm this notion: Several investigators have observed shifts, with increasing age, in the patterns of associates, and such shifts seem to occur fairly late in the course of overall linguistic development. The well-known "syntactic-paradigmatic shift" (Entwhistle, Forsyth, and Muuss, 1964) seems to occur primarily between the ages of four and eight years. Although investigators of this shift have not usually linked it

specifically with lexical development, such a shift is certainly consistent with the notion that something in the child's lexicon is changing during that period.

An explanation of the fact that semantic features are acquired slowly--relative to phonological and syntactic features--has only been sketched. McNeill (1970) suggests that this may be partially due to an innate propensity for acquiring phonological and syntactic information first, and partially due to the fact that the meaning of a given word is often not as readily derivable from observing its use in everyday discourse as are its phonological and syntactic properties (which tend to be more obviously exhibited in the acoustic signal of the sentence). In other words, a child is seldom given an explicit or ostensive definition of a word, but he is given its phonological form and syntactic distribution. A primary objective of the present study will be to show that the FWAT can be used as a tool to investigate the acquisition of this semantic information by children in general and retardates in particular.

The Nature of the Free Word Association Task

In order to justify the use of the FWAT in the investigation of lexical development, it is necessary to speculate about the mental processes which go on during the task. While the details of the internal activities remain quite opaque, some general outlines of what must happen seem to follow fairly directly from the initial assumptions we have already made about the nature of the lexicon. But to be specific:

(a) The lexicon is assumed to be the totality of information a speaker/listener has about the words of his language.

(b) It is essentially a passive storage device which must be accessed by various mental processes (strategies) which deposit and retrieve information.

(c) The phonological and syntactic information relative to a given word are acquired at a faster rate than is the semantic information.

Given this framework, we further assume that in order to perform appropriately in the FWAT, the subject (S) must carry out the following activities each time a stimulus word is presented: First, the phonological form of the stimulus word is used to retrieve whatever information is contained in the lexicon relative to that word. Next, depending on the sorts of information obtained as a result of that retrieval operation, one of a set of strategies is employed to search for another lexical item, the phonological form of which is then pronounced as the response.

It should be noticed that we are not assuming that words are directly linked together in the lexicon, but that they are linked indirectly through the information in their lexical entries and a set of search strategies. Thus, the relationship between any particular stimulus word and the response given to it is a function of three factors: The content of the lexical entry for the stimulus word, the specific search strategy used to find the response (including the sort of information it requires from the stimulus word to initiate the search) and the contents of the

lexical entries of various candidate response words. For example, one search strategy might require, as input, the syntactic characteristics of the stimulus word along with a semantic marker designating a category to which the referent of the stimulus word belongs. It then might search the lexicon for another entry having the same syntactic information and the same category-membership marker. Such a strategy would produce a response which is a member of the same semantic category as the stimulus word ("coordinate"), such as _blue_ to _red_ (both members of the category "color") or _chair_ to _lamp_ (both "furniture") etc. Another strategy might merely use the phonological characteristics of the stimulus word and search for a response having some of those same characteristics--producing sound-alike or "clang" associates (_bong_ to _long_, _bright_ to _bread_, etc).

While positive examples of a given search strategy in the FWAT are relatively easy to detect by noticing the relationship between stimulus and response, the failure of a _S_ to give a certain kind of response--say, a coordinate--to a given stimulus may, unfortunately, be assignable to any one of a number of causes: It is possible that the entry for the stimulus word did not contain a useable category marker; or perhaps _S_ simply did not happen to select or have available to him the coordinate search strategy. The latter dual possibility illustrates the major disadvantage of the FWAT as an instrument for investigating lexical development: it is too broad and nondirective a task. That is, the experimenter (_E_) does not have enough control over what _S_ is doing. In the past, this

drawback has been explicitly recognized and attempts have occasionally been made to force the use of a given search strategy through the use of instructions (e.g. to give only coordinates), however, the "restricted" association norms published by Riegal (1965) clearly show that instructing S to give a certain sort of associate by no means assures that he can or will follow those instructions. When such a procedure is applied to retarded children it loses virtually all meaning; indeed, Milgram and Goodglass (1961) found that special instructions were ineffective in normal children below the age of nine; and, while Neman (1968) found that instructions did have an effect on eight-year-olds, the effect was not what he predicted. Thus, there seems to be no easy way at present to force a child to use a given search strategy in his retrieval of a response--therefore, the failure of a S to exhibit a given strategy cannot be used as evidence that he does not have it available to him, and all FWAT data must be interpreted accordingly. On the other hand, if a child does exhibit a given strategy--i.e. a given relationship is found to hold between a stimulus word and his response--then this is consistent with the interpretation that he not only used the search strategy implied, but that he also had the information required by the search strategy available to him in the lexical entries for the stimulus and response words.

The Work of Moran on Associatives Sets

Indirect support for the above characterization of the mental processes underlying the FWAT comes from the work of Moran and his coworkers

(e.g. Moran, Mefford and Kimble, 1964; Sullivan and Moran, 1967; Swartz and Moran, 1968; and Moran and Swartz, 1970). They noticed that:

> "Many adults enter the free-word-association experiment with an enduring disposition (set) to give predominately one category of associate, regardless of word list or occasion. These adults behave much as if they were under controlled association instruction, e.g., 'give a synonym (or antonym, etc.) of these words,' 'although typically they are unaware of the systematic features of their associations (Watt, 1964)'." (Swartz and Moran, 1968).

Four distinct "idiodynamic associative sets" have been found by these investigators in a wide range of populations including first grade children (Sullivan and Moran, 1967), monolingual Japanese (Moran and Murakawa, 1966), mental retardates (Keilman and Moran, 1966; Seitz, Goulding, and Conrad, 1969), and many samples of US college freshman (Moran, 1966). These sets were labeled synonym-superordinate, contrast-coordinate, functional, and predication. Recently Moran and Swartz (1970) have attributed these observable set phenomena to various cognitive "rules" comparable to what we have labeled search strategies. In support of this claim, they found that a teenage S who evidences a certain set (or rule) at one point in time will very likely evidence the same set when retested on the same stimulus list two years later--even though the exact response words he gives are not the same. Moran and Swartz account for the fact that different people exhibit different sets by postulating that each person has all four rules, but that he has particular preferences for

using some over others; thus they hypothesize a hierarchy of rules within an individual as opposed to a hierarchy of word-word bonds, as some other FWAT investigators have done.

It is relatively easy to construct various search strategies that could underlie Moran's four idiodynamic sets. For example, we have already sketched a strategy that would produce coordinate responses. To produce a "predication" response to an adjective, information would be drawn from the adjective's lexical entry specifying what sorts of nouns it can modify (linguists call such specifications "selectional restrictions"), then a search is made of the nouns in the lexicon for an entry having the properties specified in the given selectional restriction. The "contrast" strategy would be essentially similar to the coordinate strategy except that the category marker would refer to a dimension (which can be thought of as a category in which members are mutually ordered, as opposed to unordered) and the search is for a lexical entry from the opposite end of the dimension. The "superordinate" strategy would also be similar to the coordinate strategy except that here the lexicon is searched for the English word which labels the category marker retrieved from the stimulus word's entry. A similar strategy in which the stimulus word itself is taken as a category label might produce "subordinate" responses. A "synonym" strategy could be derived either from the superordinate or from the coordinate strategy, since one could consider synonomy to refer to the common members of the most closely delimited set (coordinates) or as words satisfying the closest possible superordinate-subordinate relation. As evidence presented below will indicate, it seems most useful to consider Moran's functional set as either a conglomerate of many

specific strategies or as a single over-general strategy that takes nearly any aspect of the stimulus entry and uses it in a search for a response.

Our explanation of the set phenomenon (that the same S, tested at different times, will show a preference for the same rule) is essentially the same as Moran and Swartz's: that different Ss have different affinities for their various strategies, and that this results in a good deal of variation across Ss in the rates of production of the different types of responses.

It must also be kept in mind that stimulus words vary enormously in their compatibility with the different strategies; some words do not have opposites, some do not have coordinates, etc. (These differences, of course, derive from the contents of the lexical entries of the words.) Thus the absolute frequency with which a given S appears to use a given strategy must always be considered relative to the stimulus list employed.

Developmental Phenomena

The above discussions have focused on adult Ss and their performance in the FWAT. But how and when do these phenomena appear in children generally and retardates in particular? Table 1 summarizes the developmental data from a number of studies by Moran and his associates. They include those reported by Neman (1969) on eight-year-olds, Sullivan and Moran (1967) on bright six-year-olds, Swartz and Moran (1968) on

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Insert Table 1 about here
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bright nine and twelve-year-olds, and Keilman and Moran (1967) on retarded children. Also in Table 1 some previously unpublished data are summarized, collected from three through seven year olds by Moran.[3] All of these data, except for those of nine and 12-year-olds, were collected using the same stimulus list of 66 words. The latter data were collected using Moran's "adult" list of 80 words (cf. Moran, 1966); thus the last two rows of Table 1 are not strictly comparable to other rows. However, both the 66 and the 80 item lists were carefully balanced to provide equal representations of the various sets and contained many of the same words, so a comparison of the set useage across the two lists is not egregious.

The first four response types tabled show more or less regular increases from age 3 through age 12, while predication and functional responses appear reasonably stable throughout the period.

This increase in synonym, coordinate, contrast, and superordinate responses with increasing age is satisfying to observe since it is reasonable to expect from at least two quite distinct directions. In the first place, this increase may be just another side of the syntactic-paradigmatic shift. This is readily understandable when we notice that the search strategies underlying these four response-types all yield primarily or exclusively responses of the same form class as the stimulus word (the usual definition of a paradigmatic response). Also, this is exactly the age range in which the syntactic-paradigmatic shift has been observed to occur (cf. Ervin, 1961; Brown and Berko, 1960; Entwhistle,

1966). The predicate response-type is exclusively made up of syntactic responses, while the functional category contains both paradigmatic (sickness-doctor) and syntactic (steal-robber) responses.

An increase, with maturity, of contrasts, coordinates, superordinates, and synonyms is also sensible when viewed from quite a different quarter. These four types of responses all obviously have categorical or set operations underlying them; that is, each type of response is related to its stimulus through some use of the relation "member of," and there is a wealth of evidence indicating that categorization behavior in a wide variety of concept identification tasks (e.g. Kendler & Kendler, 1962) matures during approximately this same period. Thus, one might expect that word association behavior which involves implicit use of semantic categorization would emerge concurrently with increasing facility with non-linguistic, conceptual categorization. As far as the earlier appearance of predicative (syntactic) responding goes, McNeill (1970) has speculated that such responses may be produced by processes similar to those which the child uses to construct utterances, and if so, their relatively early appearance would not be surprising.

At this point it is not clear whether the lack of "categorical" associates at early ages is due to a lack of fully developed appropriate search strategies or due to a lack of categorical markers in the word-entries in the lexicon. Entwhistle's (1966) data would seem to indicate that the search strategies are present at least at four years old, since 10% to 20% of her kindergarteners gave contrast responses to high

frequency adjectives, and coordinate responses were relatively common at this age for high frequency nouns. (See also the top row of Table 1.) This leads Entwhistle to postulate that the associates to a given stimulus word are mainly a function of the S's familiarity with the word, rather than a function of the developmental stage he is in at the moment. She suggests that four stages may exist in the development of the associations to any given word, beginning with the most primitive stage which she calls "anomolous nouns" and progressing through "early syntactic," "paradigmatic," and "late syntactic" phases. She states:

> "All words may go through similar stages of development at a rate that depends on exposure but is modified both by discriminability of the stimulus and by contextual cues. The syntactic-paradigmatic shift, pointed to by us and others is thus reinterpreted. A word acquired very early like chair yields paradigmatics even though the subject may be four years old. Thus it is not that associations are a function of age of the subject, with four-year-olds giving anomolous responses, six-to-eight year olds giving syntactic responses, and all others giving paradigmatics. Instead, at any age, all kinds of responses are found because at all ages words are being acquired and consolidated linguistically." (Entwhistle, 1966, p. 74.)

This would imply that observed shifts in responding to any given word are due to additional material becoming available in the lexical entry for that word, rather than additional search strategies maturing. It is

primarily on this basis, then, that the present study presumes to be investigating the development of the lexicon, through the use of the FWAT, as opposed to investigating the maturation of cognitive search strategies. A caution mentioned earlier must be reiterated at this point. Moran's work on set phenomena, when combined with Entwhistle's observations, emphasize the degree to which the FWAT is only an indirect method for studying lexical development. The shifts in responding to the FWAT that can occur as a result of information being added to the lexicon may be masked by the tendencies of various S's to prefer to use of one search strategy over another. Thus, FWAT data do not necessarily reflect what a S is capable of doing in the experimental situation, but more likely what he prefers to do.

The Relationship between Age and Commonality

Perhaps the most striking changes in the patterns of associations to the FWAT as a function of increasing age in a group of children are: (a) the increase in the frequencies with which the most common responses are given to a particular stimulus word, and (b) the decrease in the total number of different responses given to that word.

"Commonality" is the general term used to describe the amount of variation in responses to any given stimulus word, and within that category both "stimulus commonality" and "response commonality" have been found to be useful notions by previous investigators. Response commonality refers to the frequncy with which a particular response word appears as an associate to a given stimulus, while stimulus commonality

is an overall index of the variability in the distribution of responses to a particular stimulus word. The latter has been measured in many different ways--ranging from the frequency of the most common response to a stimulus to the number of different responses given to it. The present discussion will only deal with stimulus commonality, and it will be defined as the mean proportion of occurrence of a given group of response words, relative to a given stimulus word, defined across a given group of Ss.

While the relationship of commonality to age has been found and described by virtually every investigator of children's word associations, the cause of the phenomenon is not at all clear. It is not even clear whether the shift in commonality is purely a function of average age of the subject population or is more directly a function of the average degree of familiarity that the group has with the stimulus word (the information present in the lexicon). If Entwhistle's observations quoted above are essentially correct, the latter notion would seem most likely to be true, and low commonality would thus be associated with meager or non-existant information in the lexical entry for the stimulus word. Her analysis of commonality showed that it was significantly related to the frequency of the stimulus word (holding age of S constant); however, it must be added that she found the relation of age to commonality to be much stronger than the relation of stimulus frequency to commonality.

Even if commonality is partially a function of the amount of infor-

mation in the lexicon of the stimulus word, at least two hypotheses are possible about the exact mental processes which underlie the commonality effect. One hypothesis would be that, when the S finds no useful information in his lexicon corresponding to the stimulus, he arbitrarily produces some random or entirely unrelated response merely to conform to the instructions of the FWAT. An alternative notion is that the first information to be stored in the entry for a word just being introduced into his lexicon is highly variable and/or vague across Ss. Perhaps the inductive process which eventually produces and perfects the semantic entry for a word begins by depositing information which is highly dependent on the first few contexts in which the word is presented to the S; this information, then, would be extremely irregular in content across Ss and would gradually be replaced or greatly augmented by more regular information based on larger and larger samples of occurrences of the word in context. If this latter notion is correct, FWAT responses to such "primitive" lexical entries would display a high degree of variability across a group and many would seem to be entirely random or "distant". Actually, however, such responses could be interpretable as being the result of normal search strategies retrieving essentially idiosyneratic lexical information, and such associations would be totally rule-governed and quite replicable from the S's point of view. Evidence supporting this latter hypothesis was reported by Gallaher, Baumeister, and Patterson (undated) from a study by Gallagher and Patterson (1970). They constructed paired-associate lists separately for

each S in their study, with each pair being a stimulus word and the response given to it by that particular S on a previously administered FWAT. Two sorts of lists were constructed, one containing responses which the S alone gave to that stimulus (relative to a large group of Ss) and one containing responses which he also gave to a stimulus but which was given by at least 20% of the other members of the group as well. Thus, all P-A lists were composed of the stimuli and the S's own responses from the FWAT; however, in one case each response was essentially idiosyncratic to him and in the other case all responses were of high commonality. Results showed that the lists did not differ in their difficulty, indicating that the idiosyncratic responses (i.e. ones of low commonality) were not random productions by the Ss giving them but rather were as systematically related to their respective stimuli as were the high commonality responses from the Ss' points of view.

Thus, while the factors underlying the increase of commonality as a function of age are anything but clear, a reasonable interpretation, and the one most compatible to the present discussion, is that it results from more and more systematic (and culturally shared) information being deposited in the lexicon over the passage of time.

Studies of Lexical Development in Retardates

Although language development in retardates has been observed and discussed for many years (cf. McCarthy, 1964, for a review of the early literature), only recently has the study of retardates' language been

attempted within the framework of modern developmental psycholinguistics. Lenneberg, Nichols, and Rosenberger (1964) reported a longitudinal study of mongoloid children in which they concluded that, with the exception of articulation, the linguistic development of mongoloids was sequentially similar to that of normal children, but that it was slowed down and in some cases permanently arrested in an intermediate stage. They suggest that IQ _per se_ is not a good predictor of language development in these children, but that CA and motor development are more closely related to it. The data-gathering procedures used to support their conclusions were not described in detail, so it is not clear whether their various measures actually separated lexical from syntactic development; however, they do report that their measure of vocabulary development correlated highly with their other measures of linguistic development--"extent of naming" and "quality of understanding."

Another study, by Lackner (1968), using the same framework, involved the construction of a transformational grammar for each of five retarded children (CA range from 6.4 to 16.2, MA range from 2.3 to 8.9) based on 1000 spontaneous utterances each. His conclusions were that "the grammars of the retarded children appear to be subsets of an adult grammar. The lower-level grammars' phrase-structure components are very general, non-specific, and lack context sensitivity. The same is true of their transformational levels." He also found a general correspondence between the complexity of a retardate's grammar and his MA. Finally, he also noted the similarities between the apparent sequences of

acquisition of grammatical rules in normal and retarded children.

Within the more specific field of lexical development, the fact that vocabulary size (number of lexical entries) increases with MA is almost too obvious to mention. Indeed, many IQ tests use some form of vocabulary size estimation as an index of MA. While most such tests involve the assumption that word meanings are acquired in the same order, relative to one another, in normal and retarded children, they are devised simply to discriminate between children of different abilities and do not illuminate the mechanisms underlying lexical growth. That is, the reasons why some Ss pass an item and others do not are generally not even pondered during a test's construction, and so these instruments are of little use to the psycholinguist.

Several investigators have recently published studies of word association in retardates. We have already mentioned Keilman and Moran's (1966) results, partially reproduced in Table 1, which showed that logical responses increase and predicative responses decrease as a function of increasing maturity (their higher-level group had a higher mean CA than their lower group as well as a higher mean MA). Their results also indicate that "distant" responses decrease with increasing MA. A follow-up study on the same children by Seitz, Goulding, and Conrad (1969) indicated that while the older group had changed little in the two-year interim period; the younger group had shifted to a response pattern similar to the older group--providing longitudinal as well as cross-sectional evidence for the sensitivity of the FWAT to increasing maturity. Semmel,

Barritt, Bennett, and Perfetti (1968) studied small samples of both institutionalized (I) and non-institutionalized (NI) educable retardates and matched them with two groups of normal children, one matched to the retardates on MA and one on CA. They classified all responses with respect to whether they were paradigmatic or syntactic. Their findings were that the CA-matched normals had the highest number of paradigmatics and the I retardates the lowest. The NI retardates and the MA-matched normals displayed similar patterns and were intermediate in their rate of paradigmatic responding. All of the stimulus words were explicitly chosen to be familar to all of the children. The authors' primary conclusion was that the responses of retardates appear to undergo the syntactic-paradigmatic shift much as do those of normal children with similar MAs, but that institutionalization is possibly an additional retarding factor.

Entwhistle (1966), while not studying retardates per se, did categorize her Ss into groups of high IQ (above 122), medium IQ (95-105) and low IQ (85 or less). Her mean IQ for the low group was about 77, placing many of these children in the educable retardate category. Her general findings are consistent with those reported so far: She found that, for a given CA level, low IQ subjects performed at a level approximately one to two years younger than did the high IQ group. As in Semmel et al.'s study, the low IQ Ss seemed to respond just as a younger child would who had a higher IQ. Both shifts in commonality and syntactic-paradigmatic responding reflected this pattern.

Summary. To summarize this section, we have argued on several grounds that the FWAT appears to be sensitive to lexical development and that it has the potential to extend our knowledge of the development of word meanings in children; however, we have also indicated that the majority of previous FWAT studies were not designed and executed as studies of lexical development. In the area of lexical development in retardates, the sparse evidence accumulated to date indicates that language development in general and the development of word meanings in particular probably proceeds much as it does in normals--albeit at a slower pace; however, again, the problem has not been attacked as directly as is possible. The empirical work to be reported in the remainder of this paper was an attempt to evaluate more thoroughly the theoretical notions discussed above.

Method

Subjects

The retarded populations on which these data are based were located in three Texas State Schools for the Retarded (in Abilene, Austin, and Denton) and in two urban independent school districts (in Austin and Galveston, Texas). The State Schools were all residential in nature, and thus the Ss drawn from them can be classified as institutionalized (I). By contrast, the Ss drawn from the independent school districts were all living with their parents and were currently enrolled in special education classes, so they will be referred to as non-institutionalized (NI).

Altogether, data were collected from approximatly 120 I and 120 NI retardates; however, 23 of the I and 44 of the NI children proved to be native Spanish speakers. Their data were not included in any of the analyses reported below.

In order to facilitate comparisons between the performance of retarded and of normal children on the FWAT, comparable data were collected from 59 normal children, approximately 15 in each of grades 1 through 4. These children were all performing adequately in a lower-middle class public elementary school in Austin. All were native English speakers.

The Sampling Procedure

The specific children were not selected in a random way, but were obtained as follows:

(a) In the State Schools, data were collected from as many Ss as possible who had the following characteristics: no gross visual, hearing, or speech impairment; enrollment in the day-school curriculum at least at the trainable level; and ability to give responses to a majority of the words on the stimulus list.

(b) In the public schools, the experimenters (Es) were assigned by the school administration to a particular set of classes which were thought to be roughly comparable to the population of the State Schools with respect to socio-economic status and ethnic background. Data were then collected from all members of these classes.

(c) The normal children participating in this study were drawn from a public school roughly comparable in socio-economic level to that of the retarded Ss. Teachers in grades one through four were asked to select children for the study who were performing at an "average level" in their classes. This strategy was used because MA scores were not available for these children and thus it was desireable to use CA as an estimate of MA.

In the remainder of this report, all I Ss are pooled across the three State Schools, since no systematic differences could be identified among the three resident groups on any of a number of demographic characteristics. Likewise the NI Ss were pooled across the Austin and Galveston groups, again because preliminary analysis indicated them to be quite homogeneous.

Insert Table 2 about here

An examination of Table 2 shows that the I and NI samples differed from each other in terms of MA, CA, and IQ. The I Ss were significantly older in terms of CA than were the NI Ss (mean CAs were 12.8 yrs. vs 10.7 yrs.), and they also had significantly higher mean MAs (7.2 yrs. vs 6.5 yrs.). However, in terms of IQ, the NI sample was significantly brighter than the I sample (mean IQs = 62 and 55 respectively).

The I and NI groups were each divided into high and low MA sub-

groups. To do this a somewhat arbitrary cutting point was established at 7.0 yrs., which could be a common cutting point for both groups and still have subgroup sizes reasonably similar to each other. The price paid for this method of defining high and low MA groups was a lack of equality between the low MA:I and the low MA:NI groups with respect to mean MA. The means of 5.8 and 5.3 years were significantly different from each other ($t = 2.77$, $p < .01$). This stems from the basic fact that young retardates with IQs of around 40 and above simply are not placed in the institutions involved in this study until they are seven to nine years old, while such children are enrolled in public special education classes shortly after entering first grade.

Unfortunately, IQ also varied systematically across the high-low MA groups, with the high MA Ss having a somewhat higher mean IQ as well (63 vs 55 respectively). This difference among the I Ss was 11 points, but among the NI Ss was only five points.

Thus, the manner in which Ss were divided into high and low ability levels confounds MA, CA, and IQ; however, since this study is merely one to describe developmental trends, it was not felt to be a serious drawback.

The preponderance of males should also be noted in all but the normal sample. This should not affect the generality of the findings since Entwhistle (1966) has shown that any sex differences among normal children on the FWAT are merely a function of females being slightly advanced in overall verbal development at this age range.

The choice of MA--as opposed to CA--as a basis for dividing the samples into high and low ability groups deserved some justification. Subsequent correlational analysis of the data reported here showed the following: (a) For NI Ss, the correlation between MA and CA was .90, making the choice between them essentially irrelevant. (b) For the I Ss, the correlation was .57. (c) For the I Ss, correlations between various shifts in the patterns of word associations and MA were consistently stronger than the corresponding correlations with CA. Therefore the use of MA as the measure of ability level was the obvious choice to bring shifts in the data into sharpest relief.

Stimulus Words

The list of stimuli was made up of 40 words and had been constructed and used by Moran (1966) for the purpose of investigating idiodynamic response sets in the FWAT. Each of the first 10 words in the list tended to elicit responses from all of the three major set-types that he had previously identified (Moran, Mefferd, and Kimble, 1964); the next 12 words were each compatible with two of the set types, and the remaining 18 words each were compatible with just one set-type. The words and their Thorndike-Lorge (1944) frequencies are given in Table 3.

Insert Table 3 about here

Procedure

Each child was tested individually. Upon entering the experimental

room, he was seated and told to say the first word that came to mind when each stimulus word was pronounced for him. (All stimuli and responses were oral.) Three example stimuli were then presented and discussed until it was reasonably clear that S grasped the basic idea of the task. The 40 stimulus words were then given by E. Immediately after pronouncing each stimulus word, E started a hand-held stop watch and stopped it as S pronounced his response. The response and the reaction time (to the nearest 0.1 second) were recorded on a data sheet by E. If the child did not respond within 20 seconds, he was scored as having given no response.

Experimenters

Because of the physical distances separating the various subject populations, several Es were used and they were not counterbalanced across subject groups. All Es were graduate students in psychology or technicians with extensive experience in testing retarded children.

Data Processing

The data collected for each S were first transferred to IBM code sheets and then to punched cards. For each S, one card was reserved for subject identification and information drawn from the child's permanent file such as chronological age, mental age, IQ, date of institutionalization, etc. Seven additional cards were then devoted to his responses and associated reaction times. Multi-word responses were merely scored as such (coded MW) and not analyzed further.

A computer program was then written to input the above cards and

produce norm tables, by stimulus word, across any given group of Ss. Using this program, a single set of norm tables was produced across the approximately 230 total Ss (170 retardates and 59 normals). This set of tables was then used as a basis for computing all commonality scores for all the stimuli and responses and it also was used as a master list of responses for their assignment to the categories described below.

The Category System

In the first section of this paper we argued that one could study lexical growth by studying the apparent relationships between stimuli and responses on the FWAT, and that these relationships were interpretable in terms of various lexical search strategies. This implies the need for a category system by which one can group different responses which are the result of the same search strategy. Moran and his associates have produced a scheme which does essentially this, and we have already shown that their results are generally interpretable within the present framework. One can also think of the syntactic and paradigmatic categories as a very simple, but basically similar sort of classification system. This latter system, obviously, is too general for present purposes, since the strategies postulated here are more specific than just searching for a response of the same form class as the stimulus or one which is sequentially appropriate.

While the Moran category system seems to be the most appropriate one devised to date, the method by which his data are placed in the various categories was not optimal for present purposes. He used, as a

basis for all categorization, the responses of 482 college undergraduates to his word list. His procedure was essentially to categorize the responses of this group by hand (cf. Moran, et al., 1964; Moran, 1966) and then to use them as a "scoring manual" to code the responses of other subject-groups. For example, scoring the responses of the children in the developmental studies reviewed in Table 1 consisted of looking up each child's response to each stimulus word in the scoring manual and assigning it to whatever category the manual dictated. Any word given by the child but not given by at least one of the 482 undergraduates automatically was not scored. This, we felt, was a major disadvantage of Moran's system when the subject groups being tested may be quite dissimilar from college undergraduates.

Another disadvantage of Moran's system was that it paid relatively little attention to syntactic responses as such; his "functional" category contained both paradigmatic and syntactic associates while his only purely syntactic categoary was "predication," containing adjective-noun pairs (but see Neman, 1968, for a recent redefinition of the functional category). If one considers syntactic associates to be--as McNeill postulates--a product of sentence production strategies, then there are several sub-strategies that might be differentially employed, corresponding to the basic syntactic relations of "subject-verb", "verb-object" and modification (cf. Chomsky, 1965, for a discussion of the liguistic notion "syntactic relation").

The above considerations led to the formulation of a system for

categorizing associates which was similar to Moran's but somewhat more complex and perhaps better suited to the particular needs of the present study. First the categories and their definitions will be presented, followed by the rules used to apply them.

1. Automated. A pair which would be coded as coordinate except that the pair was highly automated and sequential (i.e., one member of the pair is first in the large majority of utterances). The stimulus is the first member of the pair and the response, the second. salt-pepper, table-chair.

2. Backward automated. Same as category 1, except the stimulus is the second member of the pair and the response is the first. pepper-salt, chair-table.

3. Opposite. The stimulus and the response must share a common dimension in their meanings and must occupy positions on opposite sides of the midpoint of that dimension. Occasionally, the two words are not of the same part of speech. happy-sad, joy-sad, joy-cry.

4. Coordinate. The stimulus and response are members of the same set, where the set is less inclusive than physical object, action, etc. For each stimulus word, the three coders assigned, in advance and after mutual consultation, the highest order set that would be considered as the basis for the assignment of a stimulus-response pair to 4. This list of sets is given in Table 3. Both stimulus and response are required to be members of the same syntactic class. table-bed, salt-sugar, scissors-knife.

5. Miscellaneous paradigmatic. Residual category for cases where the stimulus and response are obviously semantically related, and from the same syntactic class, and do not qualify for categories 1, 2, 3, 4, 6, or 7. boy-dirt, ship-anchor, doctor-shot.

6. Superordinate. The response is the name of a set or category that contains the stimulus. table-furniture, boy-person, salt-seasoning.

7. Subordinate. The response is a member of the set named by the stimulus. color-green, boy-me, (if the respondent is a male).

8. Modifier-modified. The stimulus is an adjective (or adverb) and the response is a noun (or verb or adjective). The sequence could not have a bizarre or anomalous meaning. green-grass, happy-girl.

9. Modified-modifier. The same situation as in category 8 except the stimulus is the modified and the response is the modifier. grass-green, nice-very.

10. Subject-verb. The stimulus is a noun and the response a verb such that they could be used together as subject and verb in a sentence which is perfectly grammatical and semantically ordinary. boy-run, whistle-blow.

11. Verb-subject. The same situation as category 10 except that the stimulus is the verb and the response the subject. run-boy, write-man.

12. Verb-object. The stimulus is a verb and the response a noun, such that the noun could be used as the direct object of the verb in a perfectly grammatical and semantically reasonable sentence. cut-paper, smoke-tobacco.

13. Object-verb. Same situation as category 12 except that the stimulus is the direct-object and the response the verb. paper-cut, chair-break.

14. Miscellaneous syntactic. Residual category for pairs that are obviously semantically related but of different syntactic classes and do not fit into category 8, 9, 10, 11, 12, or 13. chair-sit, table-eat.

15. Physical similarity. Any pair for which it is reasonable to assume that the response was chosen either partially or wholly because of physical similarity to the stimulus (acoustic similarity). If the members of the pair share the same initial consonant cluster or if they rhyme, they qualify for this category.

In addition to inventing the above definitions, it was necessary to devise a set of rules for applying them to the data. The main function of these rules was to govern the assignment of the stimulus-response pairs to multiple categories. Such multiple assignment, in turn, was necessitated by the fact that the majority of stimulus-response pairs in the FWAT contain some sort of syntactic ambiguity, thus making it difficult or impossible to infer just which categories they should be assigned to.

A distinction was made in the present system between polysemy and syntactic ambiguity. The former occurs when a single word has several distinctly different meanings attached to it (as in steal-steel, peer-pier, plane-plain, etc.); the latter merely results from the lack of morphological information so common to most English word forms. A word

is syntactically ambigious if, even though its basic semantic characteristics are constant, its syntactic class cannot be uniquely determined when it occurs in isolation (e.g., milk as either a noun or verb). Our decision was to preserve obvious polysemy and arbitrarily resolve syntactic ambiguity. In the former case, multiple categories were assigned to a single stimulus-response pair according to each of the possible meaning-combinations. In the latter case, syntactic ambiguity was resolved wherever possible in favor of paradigmatic responding. To implement this decision in a reasonably reliable way, the following rules were devised tc establish a sort of hierarchy among the categories. These rules form a sequential program which was followed by the coders for each stimulus-response pair that was categorized:

(a) Test the pair to see if it qualifies for category 3; if so, code it as such and exit the procedure; if not go to (b)

(b) Test the pair to see if both members can be members of the same syntactic class. If so, test them to see if they fit into categories 1, 2, 4, 6, or 7 (see definitions above). If so, code as such and exit; if not go to (c)

(c) Test to see if the pair can be considered as belonging to different syntactic classes. If so, test to see if they can be coded into categories 8, 9, 10, 11, 12, or 13; if yes, code them into as many as possible and exit. If no, go to (d)

(d) If the pair could be members of the same syntactic class attempt to code into category 5; if successful, do so and exit; if not, go to (e)

(e) Attempt to code the pair into category 14; if successful, do so and exit; if not, go to (f)

(f) Code the pair as "unscored."

These rules have the effect of limiting the codings of any single pair of meanings to a relatively few multiple category assignments. Category 15 is not mentioned in the rules because physical similarity was considered to be entirely independent of the "meaning" relations defined by the other categories; thus category 15 was coded in a separate operation. Otherwise, the net effect of the rules is that only categories 8, 9, 10, 11, 12, and 13 can co-occur with each other for a given meaning-pair; of course, in cases of polysemy, each stimulus-response meaning-pair was coded separately.

The Assignment of Codes and the Estimation of Reliability

All stimulus-response pairs were coded separately by three coders using the above set of definitions and procedure rules. These codes were collated onto a master sheet and processed as follows: For those pairs that were coded identically by all three coders it was assumed that they were correct and were not considered further. This was the case for 2433 of the 3761 different S-R pair-types or 64.7%.

For the remaining 1328 cases, where a discrepancy was evident among the category assignments made by the three coders, each pair was discussed by the three coders until unanimous agreement was reached on the proper coding. Also, in each case, some record was made with respect to the apparent nature of the discrepancy, and this was also tabulated. In

particular, each coder discrepancy was assigned to one of three categories:

(a) Mistake: the disagreement resulted from one or more coders making a clerical error or clearly failing to follow the rules of the categorization procedure.

(b) Incomplete coding: The discrepancy resulted from one or two coders not noticing a possible category into which the pair could be placed. This usually resulted from either the stimulus or the response (or both) being lexically ambiguous and one of the coders merely not noticing the ambiguity. Thus, these were all errors of omission.

(c) All other discrepancies: This residual category was composed chiefly of two discernably different types of disagreements and then an assortment of many much less frequent kinds. One frequent type was caused by differences among the coders in their linguistic intuitions. For example, is milk-cow an appropriate adjective-noun usage (as in That is a milk cow)? In general, these cases were handled permissively; that is, if one coder felt the usage was totally regular in his dialect, the categorization was allowed. If all agreed that it was at best marginally acceptable, the coding was eliminated. The other major source of disagreement stemmed from the application of the category system itself; for example, the decision as to whether a pair should be coded as coordinate or miscellaneous was often difficult to make. These problems should be considered as

indiginous to the category system and to the rules for applying it, and thus are perhaps the most serious of those discussed here.

Table 4 gives a summary of the different types of coder disagreements for the different stimulus words. Since three coders coded all the material, it seems reasonable to assume that the number of mistakes and/or incomplete codings which survived the final discussions was very small; however, the same cannot be assumed for the residual category of discrepancies. In the case of differences of linguistic usage among the coders, it is indeterminate whether their intuitions were representative of the dialect community being studied. Two of the coders were natives of Texas and the third was reared in the Midwest but had lived in Texas for approximately five years. It is possible that different coders might have had quite different intuitions about the acceptability of some of

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Insert Table 4 about here
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the S-R pairs. Similarly, in cases where it was simply unclear how to apply the category rules to a given pair, there is no assurance that the deliberations of the coders were either valid or reliable.

Thus, in attempting to arrive at an overall reliability estimate for the coding process, only a lower bound seems appropriate; that is, approximately 86%. This would assume that all mistakes and incomplete codings were eliminated by the use of the three coders and that all of the residual disagreements were resolved in an erroneous, random way.

It would seem plausible that the latter assumption is too strong and thus that the actual reliability of the procedure was a good deal higher.[4]

Data Processing Procedures

A number of dependent variables were constructed using the data described above. For purposes of comparing the various groups to one another, measures were computed for each S indexing his performance across the entire 40 word list. These measures were:

(a) Number of Faults--number of stimuli not responded to in 20 seconds.

(b) Mean Overall Commonality--the mean of the commonalities of all the responses that S produced (not including multi-word responses).

(c) Number of Unique responses--number of responses given by that particular S only (out of the 230 Ss).

(d) Number of Unscored responses--number of responses not allocated to any of the 15 categories.

(e) Overall Mean Rate of response--the mean of the reciprocals of all the response latencies for the S (omitting the faults).

(f) The proportion of each S's responses in each of the 15 categories.

This produced a total of 20 dependent variables for each S.

In order to look at differences in the dependent variables as a function of differences between the stimulus words (form class, Thorndike-Lorge (T-L) frequency, etc.), each of the variables listed above was also computed for each stimulus word separately for each group of Ss. Various

analyses of all these data are reported and discussed in the next section.

Results and Discussion

Results Summed Across the Stimulus List

Two-way analyses of variance were conducted on the measures defined in the preceding section and the results of these analyses are presented below. Mental Age and institutionalization were the independent variables. It should be noted that these measures are all based on the S's performances on the entire set of the 40 stimulus words. In general, the performances of the retardate groups will be compared with each other, and then the relationship of the normal group to them will be discussed in a later section.

Analysis of Faults. The mean number of faults across the 40 word list for the retardate groups ranged from 1.6 for the NI high MA group to 3.3 for the I low MA group. Overall, I Ss had more faults than NI Ss ($F = 4.89$, $p < .05$) while low MA Ss had slightly--but not significantly--more faults than high MA Ss ($F = 2.64$, $p > .10$). Normals had an average of 1.9 faults.

The failure to find a significant effect for MA is perhaps surprising, as is the presence of an effect for institutionalization. While the authors have no supportable explanation for this finding, it is possible that the number of faults is determined mainly by the degree of rapport

between E and S; and the Es informally observed that the NI Ss seemed to be generally more at ease in the testing situation than were the I Ss.

Mean overall rate. The mean rates for each group, calculated in responses per second across all of each Ss responses (excluding faults), were: I high MA = .39, NI high MA = .44, I low MA = .31, and NI low MA = .30. Analysis of variance for the four retarded groups showed that high MA Ss were significantly faster than low MA Ss ($F = 34.72$, $p < .0001$). The difference between the two MA groups among NI Ss was somewhat greater than among the I Ss, making the MA by institutionalization effect approach significance ($F = 3.74$, $p \cong .05$). The fact that reaction time in the FWAT decreases as a function of increasing maturity is not surprising, since it is a common finding that older children do virtually everything faster than younger children. It is interesting to note (in view of the analysis of faults) that the NI Ss did not respond significantly faster than did the I Ss (.37 vs. .35 responses/second respectively). Thus, it would seem that not responding to a stimulus is at least somewhat different from responding slowly. The product-moment correlation between the two measures, across all groups, was -.35.

Measures of response commonality-idiosyncracy. In the first section of this paper, previous investigations were reveiwed which showed that, as a group of children matures, their responses show less and less variety and more and more commonality. Three of the present dependent variables can be regarded as global measures of commonality: overall mean commonality, unique responses, and unscored responses. The first two are defined

purely in terms of a reference group of responses (in the present case, this was the responses from all 230 Ss tested in the study) while the latter is entirely relative to the category system being used.

The means for the four retardate groups and the normal group for each of the three variables are given in Table 5. Overall Mean Commonality and Unique Responses produced nearly identical analyses for the retardate groups. In both cases the only significant effect was the main effect for MA ($F = 50.82$, and $F = 52.15$, respectively; $p << .001$ in both cases). (That these two measures index the same phenomenon is illustrated by the product-moment correlation coefficient between them, across all Ss, of -.84.) Analysis of the Unscored Responses showed a similar strong effect for MA ($F = 51.94$, $p << .001$) but also a significant effect for institutionalization ($F = 4.80$, $p < .05$), with NI Ss giving somewhat more unscored responses. Except for this institutionalization effect, these results are strongly in accord with previous literature. Of course, it must be kept in mind that the number of Unscored Responses

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Insert Table 5 about here

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is not prima facia a measure of commonality, but is more an index of the extent to which the strategies reflected by the category system are evident in the S's responses.

Proportions of category usages. In the introductory discussion, the work of Moran and his associates was reviewed, indicating that as a child matures, more and more of his responses fall into the synonym, super-

ordinate, coordinate, and contrast categories. (Which we have labeled the logical categories). Interpreting Moran's findings into the present category system, we would expect to see an increase in categories 1 through 4, category 6, and perhaps 7. Tables of mean proportions of usage of these categories are presented in Table 6. In general, analyses of these data supported the above predictions. Among retardates, analysis of opposites yielded only the expected main effect for MA ($F = 21.89$, $p < .001$). The analysis of coordinates showed a similar effect for MA ($F = 21.90$, $p < .001$) but also a much weaker one for institutionalization ($F = 5.33$, $p < .05$), with I Ss giving more coordinates than NI Ss. Superordinates also showed a substantial MA effect ($F = 22.43$, $p < .001$) and no others. The analysis of subordinates and automated coordinate

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Insert Table 6 about here
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responses showed no significant differences; and category 2 responses (Backward Automated Coordinates) occurred too infrequently to permit analysis.

Category 5, miscellaneous--though meaningfully related--associations of the same form class, showed a pattern opposite to that of the logical categories. As shown in Table 7, usage of this category was weakly negatively related to MA, particularly within the I group.

Insert Table 7 about here

Categories 8 through 14 involved syntactic responses of various kinds. Extrapolating from the literature on the syntactic-paradigmatic shift phenomenon, one would expect the mean proportions in them to decrease with increasing MA. The relevant means are presented in Table 8. Analyses of variance on each of the variables showed the expected effect only for the mean proportion of noun responses to adjective stimuli ($F = 5.16$, $p < .05$).

For all the data summarized in Table 8, there was only one other statistically reliable effect, an interaction between institutionalization and MA for the proportion of verb responses given to subject-noun stimuli ($F = 5.78$, $p < .05$). Among NI Ss, low MA children gave more such responses than did high MA children, and for I Ss, exactly the opposite

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Insert Table 8 about here
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was observed.

Finally, the means for category 15--responses with physical similarities to the stimuli--are presented in Table 9. Ervin (1961) and

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Insert Table 9 about here

Entwhistle, Forsyth, and Muuss (1964) have reported that, in normal children, the number of such responses decreases steadily from kindergarten to at least sixth grade. Thus, the prediction for the present data would be that the mean proportion of physically similar responses

should decrease with increasing age. Such a trend for retardates can be discerned (chiefly for the NI Ss) in Table 9; however, it was not found to be statistically reliable ($F = 3.07$, $p < .10$). A stronger effect was obtained for institutionalization ($F = 18.68$, $p < .001$) with I Ss producing more physically similar responses than NI Ss.

Comparison of normals and retardates. Peculiarly, the normal Ss had a higher proportion of physically similar responses than any of the retardate groups. This is the one instance where normal Ss, relative to the retardates, performed in a way which would not have been generally predictable from their mean MA (assuming mean MA equals mean CA for this group). Inspection of Tables 6 through 8 show that in all other cases, their usage of the category system was quite similar to the high MA retarded groups. In fact, t-tests indicated that except for category 15, there was no category where the mean proportion for normals was significantly different from the means of both the high MA retarded groups. Significant differences between normal and both high MA retarded groups did appear, however, both on Overall Mean Commonality and on Unique Responses. The former variable was higher for normals than for retardates--indicating more agreement among normals than among retardates, while the latter was also higher--indicating more idiosyncratic responses for normals. This apparently contradictory finding may be due to the fact that normal children were under-represented, relative to retarded children, in the overall norms used to define these two measures. The ratio of normal to retarded children was roughly one to four, and, if the

content of their lexicons was uniformly slightly different than that of the retardates, especially for relatively unfamilar words, this could account for the above finding. It should be noted that normal Ss did not have significantly more unscored responses than either of the high MA groups.

Discussion of summated results. The majority of the significant results reported above are relatively straight-forward to interpret. They show a marked increase,with increasing maturity, in the use of logical search strategies in the retrieval of responses in the FWAT. The only result possibly not supporting this interpretation is the failure to find a main effect for MA in the Automated Coordinate category. A possible reason why this did not occur is that the lexical entries corresponding to chese responses are learned so early in the language acquisition process that their rate of occurrence are already stabilized across the entire MA range represented in this study.

The second clear-cut result is the decrease, for retardates, of idiosyncratic (unique and unscored) responses with increasing MA, and the corresponding increase in Overall Mean Commonality. As discussed in the first section of this paper, such a shift could be due to the replacement of idiosyncratic information in the lexicon with more systematic information; or it could be due to a decrease in "random" responding as information accrues to the lexicon. The apparent deviation of the normal group from this pattern has already been noted; however, further interpretation of this result is not possible without the presence of a young normal group. The hypothesis that the number of

Unique Responses generally increases with CA among normals of this age range would not seem to be tenable (despite findings by DiVesta, 1964) since its correlation with CA in the normal sample was -.27 ($p < .05$). The correlations of average Overall Commonality and Unscored Responses with CA were -.35 and -.22 respectively within the normal group.

Perhaps the most surprising single finding is the one for the category of physical similarity. Here the predicted relationship to MA did not appear in a regular way, but there were strong differences among the I, NI, and Normal groups. Given the present theoretical framework, one is tempted to say that this is a strategy that all Ss have available to them--even the youngest ones--and that the extent to which a given S employs it is dependent upon his orientation to the task situation, and perhaps to the E, rather than being dependent upon the content of his lexicon. An extensive review of how specific aspects of the FWAT situation have been found to systematically affect the sorts of responses obtained can be found in Cramer (1968).

At this point we have no interpretation for either the main effect for institutionalization in coordinate responses or the significant interaction mentioned for the Subject-Verb category. Neither effect was particularly strong, nor were they replicated in other variables with which they were correlated.

The failure to find two rather general phenomena deserves mention. First, with the exception of the coordinate category, there was an overall lack of differences between I and NI retardates. This is in apparent

contradiction to Semmel et al. (1968) who found that NI Ss produced more paradigmatic associations than I Ss of the same mean MA and CA. Such an effect in the present study might possibly be masked by the fact that the mean MA for the I group was somewhat higher than that for the NI group (7.2 vs. 6.5 years respectively). To help detect such a masked effect, a simple analysis of covariance was performed on all of the variables discussed above using MA as a covariate and the I-NI split as the independent variable. (Normal Ss were not included in this analysis.) Results indicated that the I and NI groups differed significantly on only one measure, number of Faults, with I Ss failing to respond more often than NI Ss. Thus, this study can be said to offer little support to the hypothesis that I retardates have greater language handicaps than do NI retardates of similar MA. (However, see McCarthy, 1965, for evidence that I retardates have better language skills than NI retardates.) One possible reason for the failure to find such institutionalization effects in the present data may be that virtually none of the I Ss had been institutionalized prior to becoming six or seven years old. Most of them were very likely well along the way to language acquisition at the time they were institutionalized.

The second previously reported phenomenon which was not found in the present analyses was a general decrease of syntactic responses with increasing MA. While the frequency of noun responses to adjective stimuli did decrease with increasing MA, none of the other syntactic categories showed this effect to a reliable extent. Correlation coefficients be-

tween frequencies in these categories and MA (CA in the case of normals) similarly showed low degrees of association.

At first glance, such a lack of significant results would tend to cast some suspicion on a "syntactic phase" of responding in the lexical development of any words except adjectives. The usual explanation of syntactic responses is that they are words which might tend to occur with the stimulus word in some syntactic structure. However, some investigators of the syntactic-paradigmatic shift (e.g., Entwhistle, 1966) operationally define a syntactic response as any one which is not of the same form class as the stimulus. Those responses which are of a different form class and are not likely to occur with the stimulus in some syntactic relationship would thus be counted as "syntactic." The above analyses indicate, though, that the frequency of responses bearing no obvious relationship to the stimulus (Unscored Responses) decreases sharply with increasing maturity, while the overall number of "true" syntactic responses remains essentially constant across the age range, with the exception of the adjective-noun category. Thus, it may be that the decrease in "syntactic" responding reported earlier has been confounded with a decrease in unrelated (at least to the adult observer) responses. It is simply not clear at this point what the relationship is between the form class of a stimulus and the form class of an unrelated response. In fact, in many cases, the very lack of apparent relationship between stimulus and response makes the assignment of form classes to the pair extremely arbitrary (consider the pair milk-rose: are they of

the same class or different classes?) Entwhistle (1966) suspects that most of a child's earliest responses in the FWAT are nouns regardless of the form class of the stimulus. These, of course, would be considered as paradigmatic in response to noun stimuli, but as syntactic in response to all others. If a large percentage of them are actually "distant" or "unrelated" responses, then it may be that the syntactic-paradigmatic shift is actually a distant-to-paradigmatic shift (or idiosyncratic-to-paradigmatic shift).

Entwhistle reports than noun responses to nouns increases from approximately 61% in kindergarten to approximately 77% in fifth grade, while the rate of verb responses to nouns decreases from about 20% to about 11%. For verb stimuli, the decrease in noun responses is about 55% to about 20% during the same period. Finally, the decrease of noun responses to adjective stimuli was from 57% to 18% across the same age span. Clearly, the least evidence for syntactic to paradigmatic shifting is available for noun stimuli, where a preponderance of unrelated noun responses given by young children would be counted as paradigmatic. For adjectives and verbs, a similar decrease in the frequency of unrelated nouns with increasing MA would be counted as a decrease in syntactic responding; hence a large decrease in syntactic responding with increasing age would be observed.

Despite the above arguments which would lead to a reinterpretation of the syntactic-paradigmatic shift, a purely methodological characteristic of the analysis reported above was noticed that might tend to mask a S-P shift. Entwhistle (1966) presents evidence that the rate of the S-P shift

for a given word, and just when it takes place during a child's lexical development, depends partially on the rate with which the word becomes familiar to the child. If this is true, then the heterogenaeity of the present stimulus list with respect to familiarity might tend to obscure a S-P shift. Table 10 shows how an interaction between the maturity of

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Insert Table 10 about here

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various Ss and different word familarities could result in no observable shift in overall syntactic responding (summed across the entire FWAT) as a function of MA.

Analysis of Responses to Individual Stimulus Words

To help explore the exact nature of any S-P shift which might be present in the data, the responses for 30 of the 40 stimulus words were analysed individually. The data for ten words were omitted because the stimuli were obvious homonyms (they were steal, plane, die, peer, pain, crow, fiddle, whistle, jam, and tug). For each of the 30 words, the proportion of Ss giving responses in each of 4 categories was tabulated: logical, syntactic, miscellaneous (physical similarity, miscellaneous paradigmatic, and miscellaneous syntactic), and unscored. The distinction between I and NI was not kept since the previously reported analyses made it clear that there were no systematic effects on the dependent variables under consideration as a function of this categorization.

The proportions of responses given to each of the 30 stimuli by each

of the three groups of respondents (high MA retardates, low MA retardates, and normals) are presented in Tables 11, 12, and 13. They are separated

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Insert Tables 11, 12, and 13 about here

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by form class and, within each table, are ordered according to their Thorndike-Lorge (T-L) frequencies.

While tests of significance between groups(with respect to their relative proportions of any given type of response)are not particularly meaningful when so many comparisons are involved, a difference of 0.20 between any two proportions in the same column would reach at least the 0.05 level and usually the 0.02 level (depending, of course, on the numbers of responses and the absolute magnitudes of the proportions).

Examination of Table 11 shows that a syntactic-paradigmatic shift is evident for each of the six adjectives in the list. In all cases, the number of logical associates is greater for the high MA and normal groups than for the Low MA group. Also, in all but one case (sour), the high MA and normal groups have lower proportions of syntactic responses than does the Low MA group. Finally, the Low MA group is consistently slightly higher in the "unscored" category, a result compatible with the interpretation that there is a double shift for each word, first from unscored to syntactic and then from syntactic to logical associates.

Table 12 gives the proportions for 23 nouns. Here, the pattern is partially similar to that for adjectives and partially different. Again, throughout the list, the Low MA group tends to have considerably more

unscored responses than do the other two groups. A somewhat weaker effect is the larger proportions of logical responses for the higher level groups, especially for the lower frequency nouns: For 19 of 23 stimuli, the High MA group had more logical responses than did the low group; for 17 of 23 stimuli the normal group had a higher proportion of logical associates; and for 13 of the 23 stimuli the Low MA group had fewer logical responses than did either of the other groups. Thus far, the pattern is as it was with adjectives. With respect to syntactic responses, however, there is still no hint of a decrease with increasing maturity. The Low MA group has more syntactic responses than the High MA group for only 8 of the 23 nouns and has more than the normal group for only 6 of the 23. In fact, there is a slight tendency for the higher level groups to have more syntactic responses than the Low MA group. This pattern would give no support to the existence of a syntactic-paradigmatic shift for nouns. The present evidence indicates that it is a shift primarily from unscored to logical.

The pattern for the only "pure" verb in the list, strangle, is similar to the one for the nouns with no important difference in the rate of syntactic responding as a function of group maturity level; however, the shift from the unscored to the logical category again is obvious. Of course, drawing conclusions about all verbs on the basis of the responses to one is virtually nonsensical--as can be concluded from observing the wide between-stimulus variabilities evident for nouns in Table 12.

As mentioned above, the finding that adjectives undergo the syntactic-

paradigmatic shift while nouns do not does not contradict the existing literature. That Ss should pass through a stage of syntactic responding for adjectives and not for nouns is also consistent with current generative linguistic theory. Chomsky (1965) has argued that selectional restrictions are attached to adjectives, verbs and adverbs, but not to nouns. Adjectives are given selectional restrictions which indicate the range of nouns each can meaningfully modify; each verb is given a set of selectional restrictions which specifies the class of subject nouns it can be used with, and, in the case of transitive verbs, the class of appropriate objects. While this characterization was not proposed by Chomsky to account for the way lexical information is actually learned, stored, and used in the mind of the native speaker, it is certainly a candidate explanation for such psychological phenomena, and, applied to the present data, it would predict that at some stage in the learning of the lexical entry for each adjective and verb, its selectional restrictions must be learned--while such a stage would not be present in the learning of nouns. Although linguistic theory does not strongly predict just when they will be learned, it is not unlikely that such selectional restrictions are learned realtively early in the total acquisition process for a given word--since they characterize the reasonable contexts in which the word occurs. As mentioned in the first section of this paper, the very fact that three and four year olds are able to produce a wide range of outwardly sensible sentences suggests that selectional restrictions must be learned early, relative to semantic markers. Apparently, the

time of maximum syntactic responding for any given stimulus word comes when selectional restrictions have been learned, but the semantic categorical markers that have been internalized are still relatively vague or incomplete. Then, as semantic markers are added to the lexical entry for the stimulus word, an increase in logical associates occurs.

Unfortunately, because of the composition of the stimulus list, the present study has virtually no evidence relative to a syntactic-logical shift for verbs. While Entwhistle's (1966) results are not directly comparable to ours, she did include 24 verbs in her stimulus list and she reports the proportions of responses in various form classes given to them. If we assume that verb responses to verb stimuli are logical and noun, pronoun, and adverb responses are syntactic, we find that such "syntactic" responses to verbs make up 65% of all responses for kindergarteners but only 39% for third graders. Meanwhile, the proportion of verb (logical) responses rises from 17% to 47%--relatively strong evidence for a syntactic-logical shift. (The kindergarten to third grade span was chosen to be reported here since it is roughly equivalent to the MA levels of our low and high retardate groups respectively.)

One final issue should be discussed relative to the above findings: that is, the hypothesis that each word goes through its own shift in associates as semantic material is added to its lexical entry. Unfortunately, the present study did not attempt to index the knowledge each S had about each stimulus word in any way except by the FWAT, and thus no direct evidence can be brought to bear on the hypothesis. However,

one might expect that words which occur relatively seldom in the language would, on the whole, be less familar to children and perhaps would be learned later in the language acquisition process than words occuring more frequently. Essentially, this is characterized in Table 10. Using T-L frequency as a measure of frequency in the language, one would expect the last entries in Tables 11 and 12 to show more "primitive" responses than the first entries. To check this, Table 12 was divided into AA and A words as "high frequency," and below A as "low frequency". (The adjectives in Table 11 were too few and too uniform in T-L frequency to permit a similar division.) The mean proportions for the frequent and infrequent nouns are displayed in Table 14, and they offer very little support for the hypothesis. Virtually no important differences are evident for any group between response patterns to high and low frequency nouns. Of borderline significance is the low MA group which had an average of 10% more logical responses for high frequency nouns than for low, and 10% fewer unscored responses for high versus low frequency nouns. A possible reason why the effect did not appear is that the T-L index is not an accurate measure of the rate and order in which a child acquires his vocabulary. For example, scissors is rated as a low frequency word, and yet virtually all children are acquainted with the word by the age of three or four. Similar arguments could be made for shovel, ham, mask, and probably sickness. On the other hand, informal observation indicates that lamp, joy, and perhaps pain are not particularly familiar words to young children even though they are

relatively common in adult discourse and have high T-L ratings.

Referring to the patterns displayed in Table 12, some of the nouns seem to have completed an idiosyncratic-to-logical shift by the time MA reaches even the level of the low MA group. These include boy, doctor, man, milk, salt, ship, bread, and knife. Others seem to be distinctly more familar to the higher level groups than to the lower level group; these include eagle, blossom, lamp, shack, and pain. Still others, such as tobacco, sickness, mask, shovel, scissors, scab, and joy are characterized with patterns of repsonses which are either intermediate or unclear. Stronger evidence about whether the active element is really familiarity of the word will have to await further research.

An Analysis of Some Data from Young Normal Children

The research reported in this paper and the conclusions drawn from it have been based on data which are not as complete as could be desired. In particular, the lack of a young normal group, which could serve as an MA match to the low MA retarded group, would have been desireable. While the high MA retardates and the (high MA) normals did perform almost identically to each other, and while studies by other investigators, reviewed in the first section of this paper, would make it plausible that the low MA retardates display patterns very similar to those one would expect from MA-matched normals, no concrete evidence of that has been presented here.

In order to provide some such data, the investigators applied the category system described here to the responses of approximately 187

kindergarten children collected and reported by Entwhistle (1966). Her sample of kindergarteners was chosen because its average MA was as close as possible to the average MA for the low MA retarded group--approximately 6.3 years vs. 5.6 years for the retardates. Only the seven stimulus words common to the two lists were used; this included four adjectives and three nouns. The results are presented in Table 15, in which the comparable data from Tables 11 and 12 are also included. With respect to the four adjectives, it can be seen that the young normal group is essentially similar to the low MA retardate group, having relatively fewer logical responses than the more mature Ss, and more syntactic and unscored responses. The responses made to the nouns are not particularly useful since they do not seem to show any obvious developmental trends for normals or retardates; however, except for the paucity of logical responses to man, the young normal children do not appear peculiar in their distributions. This, then, adds some credibility to the present conclusions drawn for young children in general but which are based primarily on data from young retardates.

One methodological note should be made: Probably because of differences in FWAT instructions, Entwhistle's Ss gave many more multiword responses (20% or more) than did the young Ss in the present study (less than 5%); thus, the proportions in Table 15 were computed after all multiword responses had been eliminated from the response distributions.

Summary

The findings of this study are of two sorts: those relevant to the relationship of retarded children to normal children, and those relevant to better understanding the FWAT per se and its role as an index of lexical development in all children.

With respect to retardates, the present study gives support to the hypothesis that their lexical development is similar to that of normal children in its sequence, but that it is much slower. A comparison of the high MA group of retardates with the normal group showed no important differences between the two--with the possible exception of the rate of production of clangs. The low MA retardate group generally performed the FWAT in a way that would be predicted for younger children on the basis of previous literature; however, the present study did not include a younger normal group to compare directly to the low MA retardate group. The differences in the retardate data as a function of institutionalization were virtually non-existent, with no support being given to the notion that institutionalization causes any delay in the development of language above and beyond any possible retardation of global MA.

With respect to the lexical development of children in general and the use of the FWAT as a measure of it. The present findings are promising. In general, support was found for McNeill's and Entwhistle's interpretations of previously collected FWAT data as indices of lexical development; however, some degree of reformulation seemed to be suggested. In particular, the syntactic-paradigmatic shift identified by previous

investigators appeared actually to be a syntactic-to-logical shift and not to be present for nouns. This phenomenon is interpreted as indicating that the selectional restrictions for a given word are learned before any detailed set of semantic markers are acquired, with the stage of syntactic responding to a FWAT stimulus occurring when the selectional restrictions are available but detailed semantic markers are not. Since the lexical entries for nouns never contain selectional restrictions, a syntactic phase of responding for them would not be predicted to occur and was not observed.

An initial stage of responding, with highly diverse and tangentially related responses, was also identified in the present data and appears to occur when S knows little or nothing about the stimulus word--i.e. prior to the acquisition of selectional restrictions and/or semantic markers. An investigation of the exact mechanism involved in the production of these responses, however, is beyond the scope of this project.

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Footnotes

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[2]Now at the University of Oregon Medical School, Portland, Oregon.

[3]Our thanks go the Professor Louis J. Moran for generously giving us access to his data.

[4]Approximately six months later one of the original coders independently recoded approximately one-third of the original material. Agreement with the original codes was 98%.

TABLE 1

Average Percent Stimuli Eliciting Various Response Types

in Children of Various Ages

Age Range (Years)	N	Synonym	Coordinate	Contrast	Superordinate	Predicate	Functional	Average Commonality
3 to 4	36	2.6	5.5	2.3	2.3	3.0	NA	NA
5	63	4.4	4.1	2.0	3.9	5.8	NA	50.5
6.1 (MA)*	45	3.9	9.2	2.4	3.8	8.9	17.7	45.0
6 to 7	36	7.7	11.7	5.9	3.8	5.8	NA	NA
Bright 6	101	9.1	14.7	10.6	5.2	5.5	20.5	89.4
8	115	10.9	13.8	9.4	5.9	5.3	NA	88.0
9.6 (MA)*	45	9.7	17.7	9.5	6.7	5.9	16.7	82.2
9.7	102	11.8	16.3	12.5	8.3	3.4	15.6	94.6
12.7	110	14.0	18.0	13.1	7.9	3.6	17.0	103.6

*Data from retarded Ss, average MA reported.

NA = Not Available

TABLE 2

Descriptions of the Subject Groups

Group	N Male	N Female	N Total	Mean CA	Mean MA	Mean IQ
High MA:I	32	22	54	13.8	8.4	61
High MA:NI	21	10	31	12.5	8.2	65
Low MA:I	38	5	43	11.7	5.8	50
Low MA:NI	23	19	42	8.9	5.3	60
Normal	25	34	59	8.3	--	--
Total	139	90	229			

TABLE 3

The Stimulus List

Position	Stimulus Word	T-L Frequency	Broadset Category for Category 4 Membership
1	Milk	AA	Food
2	Salt	AA	Garnishment to food
3	Ship	AA	Vehicle or transportation
4	Joy	AA	Emotion or psychological state
5	Bread	A	Food
6	Shovel	14	Hand implement or verb implying use of same
7	Whistle	A	Noisemaker or signaling action
8	Ham	17	Food
9	Sickness	25	None
10	Steel (Steal)	A	Material used for building;or an evil act
11	Beautiful	AA	Implying good or pleasing appearance
12	Doctor	AA	A member of medical profession or patient
13	Plain (Plane)	AA	Vehicle; or opposite of "pretty"; or geological formation
14	Fiddle	6	Musical instrument; or non-purposeful activity

TABLE 3 Continued

Position	Stimulus Word	T-L Frequency	Broadest Category for Category 4 Membership
15	Die (Dye)	AA	A verb involving death; or a word involving coloring
16	Jam	16	Something spread on food; or hurt; or a bad situation
17	Mask	17	Involving hiding or disguise
18	Rough	A	A texture; or implying difficulty
19	Peer (Pier)	39	To see; or dock
20	Smile	AA	Facial expression
21	Green	AA	Color
22	Pain (Pane)	AA	Involving hurting
23	Boy	AA	Any person not an opposite on some dimension
24	Blossom	43	Hortocultural noun; or to emerge
25	Lamp	A	Furniture
26	Calf	14	Animal
27	Crow	37	Animal
28	Table	AA	Furniture
29	Man	AA	Any person not an opposite
30	Shack	7	Any building
31	Scissors	8	Any cutting implement
32	Long	AA	Implying measurement but not an opposite

TABLE 3 Continued

Position	Stimulus Word	Frequency	Broadest Category for Category 4 Membership
33	Eagle	38	Animal
34	Scab	1	Covering on the skin
35	Sour	15	Flavor
36	Tug	17	A kind of boat, or to pull
37	Tobacco	36	Items made from tobacco
38	High (Hi)	AA	Greeting; or position not an opposite
39	Strangle	3	Involving hurting or killing
40	Knife	A	Any table utensil or sharp implement

TABLE 4 Continued

Stimulus Word	Total Different Responses	Total Discrepancies	Mistakes	Incomplete Codings	Residual Discrepancies
Jam	93	43	20	9	14
Mask	110	57	22	20	15
Rough	9[illegible]	51	7	23	21
Peer	121	57	21	20	16
Smile	77	35	14	10	11
Green	79	26	8	12	6
Pain	120	50	13	12	25
Boy	69	38	10	8	19
Blossom	108	30	4	13	13
Lamp	90	35	7	13	15
Calf	79	25	9	6	10
Crow	99	29	4	15	10
Table	92	36	15	7	13
Man	84	38	6	8	23
Shack	112	41	14	21	4
Scissors	58	30	3	11	16

TABLE 4

Frequencies of Coder Discrepancies by Stimulus Word and Type

Stimulus Word	Total Different Responses	Total Discrepancies	Mistakes	Incomplete Codings	Residual Discrepancies
Milk	69	9	2	4	3
Salt	87	35	10	9	16
Ship	78	25	4	12	9
Joy	101	28	8	19	1
Bread	88	18	1	3	15
Shovel	82	15	2	5	8
Whistle	91	22	8	11	3
Ham	84	10	2	4	4
Sickness	103	26	4	12	10
Steel	140	53	10	13	30
Beautiful	78	27	5	15	8
Doctor	61	35	13	8	14
Plain	105	53	6	19	28
Fiddle	103	34	8	11	15
Die	105	44	10	13	21

TABLE 4 Continued

Stimulus Word	Total Different Responses	Total Discrepancies	Mistakes	Incomplete Codings	Residual Discrepancies
Long	117	42	4	22	16
Eagle	101	38	14	11	13
Scab	105	26	5	8	12
Sour	96	34	7	15	12
Tug	121	25	9	8	8
Tobacco	62	15	2	6	6
High	103	29	5	14	10
Strangle	113	39	9	14	16
Knife	82	34	12	12	10
Total	3761	1328	333	476	519
Proportion of Total		.353	.089	.127	.138

TABLE 5

Measures of Commonality

A. Mean Overall Commonality

	High MA	Low MA
I	.15	.10
NI	.15	.10
Normal	.13	

B. Unique Responses

	High MA	Low MA
I	6.2	12.2
NI	6.6	13.8
Normal	9.3	

C. Unscored Response

	High MA	Low MA
I	1.9	5.6
NI	2.5	7.8
Normal	2.7	

TABLE 6

Mean Proportions for Each Category

A. Category 1: Automated

	High MA	Low MA
I	.037	.028
NI	.022	.026
Normal	.028	

B. Category 2: Backward Automated

	High MA	Low MA
I	.005	.011
NI	.006	.003
Normal	.012	

C. Category 3: Opposite

	High MA	Low MA
I	.107	.057
NI	.105	.060
Normal	.096	

D. Category 4: Coordinate

	High MA	Low MA
I	.309	.205
NI	.244	.196
Normal	.246	

TABLE 6 Continued

E. Category 6: Superordinate

	High MA	Low MA
I	.081	.040
NI	.085	.042
Normal	.106	

F. Category 7: Subordinate

	High MA	Low MA
I	.013	.012
NI	.010	.011
Normal	.013	

TABLE 7

Mean Proportions for Category 5

	High MA	Low MA
I	.082	.112
NI	.096	.098
Normal	.082	

TABLE 8

Mean Proportions for the Syntactic Categories

A. Category 8: Adjective - Noun

	High MA	Low MA
I	.082	.105
NI	.093	.113
Normal	.081	

B. Category 9: Noun-Adjective

	High MA	Low MA
I	.058	.061
NI	.070	.052
Normal	.067	

C. Category 10: Subject-Verb

	High MA	Low MA
I	.050	.060
NI	.073	.048
Normal	.059	

D. Category 11: Verb-Subject

	High MA	Low MA
I	.013	.018
NI	.009	.014
Normal	.012	

TABLE 8 Continued

E. Category 12: Verb-Object

	High MA	Low MA
I	.016	.022
NI	.023	.016
Normal	.019	

F. Category 13: Object-Verb

	High MA	Low MA
I	.079	.052
NI	.079	.056
Normal	.053	

G. Category 14: Miscellaneous Syntactic

	High MA	Low MA
I	.045	.043
NI	.050	.055
Normal	.046	

TABLE 9

Mean Proportions for Category 15 Responses

I	.153	.159
NI	.072	.116
Normal	.200	

TABLE 10

A Possible Pattern of Responding to Words of Varying Frequency by Children of Varying MAs

	Frequency of Stimulus Word		
Subject MA	High	Low	Sum Across List
High	Paradigmatic responses	Syntactic Responses	P + S Responses
Low	Syntactic Responses	Unrelated Responses	S + U Responses

TABLE 11

Percents of Responses to Six Adjectives

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
AA	Beautiful	Normal	70	24	6	0
		High MA	72	24	1	3
		Low MA	44	49	3	4
AA	Green	Normal	61	24	10	5
		High MA	59	35	5	1
		Low MA	38	48	6	7
AA	High	Normal	64	10	19	7
		High MA	59	10	12	19
		Low MA	28	37	14	21
AA	Long	Normal	38	30	25	7
		High MA	51	31	8	9
		Low MA	30	44	4	21
A	Rough	Normal	56	32	9	3
		High MA	42	48	5	6
		Low MA	24	60	8	8

TABLE 11 Continued

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
15	Sour	Normal	34	34	27	5
		High MA	39	48	6	7
		Low MA	19	44	14	23

TABLE 12

Percents of Responses for 23 Noun Stimuli

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
AA	Boy	Normal	70	15	15	0
		High MA	79	11	9	0
		Low MA	51	19	21	9
AA	Doctor	Normal	59	12	22	7
		High MA	66	16	18	0
		Low MA	54	10	33	3
AA	Joy	Normal	14	2	84	0
		High MA	16	0	77	6
		Low MA	15	1	53	31
AA	Man	Normal	70	21	9	0
		High MA	78	10	10	1
		Low MA	67	12	17	5
AA	Milk	Normal	31	42	27	0
		High MA	56	38	7	0
		Low MA	38	36	19	7

TABLE 12 Continued

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
AA	Pain	Normal	49	2	42	8
		High MA	35	1	43	21
		Low MA	16	0	49	35
AA	Salt	Normal	45	26	5	14
		High MA	54	37	7	2
		Low MA	41	23	24	12
AA	Ship	Normal	43	17	40	0
		High MA	60	20	16	3
		Low MA	42	19	33	5
AA	Table	Normal	33	18	40	9
		High MA	54	14	20	13
		Low MA	35	9	37	19
A	Bread	Normal	45	38	20	7
		High MA	41	44	10	5
		Low MA	51	25	13	11

Table 12 Continued

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
A	Knife	Normal	35	44	19	2
		High MA	34	55	10	1
		Low MA	39	42	8	11
A	Lamp	Normal	63	9	23	5
		High MA	70	10	12	7
		Low MA	42	13	20	25
43	Blossom	Normal	66	9	11	14
		High MA	58	9	14	19
		Low MA	21	9	18	52
38	Eagle	Normal	69	7	22	2
		High MA	61	25	7	7
		Low MA	33	32	17	18
36	Tobacco	Normal	43	35	15	7
		High MA	52	40	6	2
		Low MA	38	20	5	24

TABLE 12 Continued

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
25	Sickness	Normal	24	3	61	12
		High MA	47	5	38	10
		Low MA	32	3	37	28
17	Ham	Normal	53	20	24	3
		High MA	43	44	3	3
		Low MA	49	20	17	14
17	Mask	Normal	18	39	39	4
		High MA	8	49	39	4
		Low MA	10	32	34	23
14	Calf	Normal	68	7	10	15
		High MA	84	5	9	2
		Low MA	48	10	27	15
14	Shovel	Normal	47	36	17	0
		High MA	67	14	15	3
		Low MA	53	17	14	16

TABLE 12 Continued

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
8	Scissors	Normal	14	72	10	4
		High MA	28	63	6	3
		Low MA	21	55	11	13
7	Shack	Normal	62	5	29	4
		High MA	42	11	37	10
		Low MA	18	16	32	34
1	Scab	Normal	34	22	27	17
		High MA	36	4	54	7
		Low MA	21	4	47	28

TABLE 13

Percent of Responses to One Verb: Strangle

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
3	Strangle	Normal	44	4	37	15
		High MA	58	5	21	15
		Low MA	19	11	41	30

TABLE 14

Mean Percents of Categorized Responses for High and Low Frequency Nouns

	Logical		Syntactic		Miscellaneous		Unscored	
Group	High	Low	High	Low	High	Low	High	Low
Normal	46	45	21	23	29	24	4	7
High MA	54	48	21	24	20	21	5	6
Low MA	31	41	20	24	27	24	24	14

TABLE 15

Categorized Responses of Young Normal Children as Compared to Older Normal and Retardate Responses

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
AA	High	Old Normal	64	10	19	7
		High MA	59	10	12	19
		Young Normal*	27	27	26	20
		Low MA	28	37	14	21
AA	Long	Old Normal	38	30	25	7
		High MA	51	31	8	9
		Young Normal*	9	56	16	19
		Low MA	30	44	4	21
A	Rough	Old Normal	56	32	9	3
		High MA	42	48	5	6
		Young Normal*	20	69	3	8
		Low MA	24	60	8	8
15	Sour	Old Normal	34	34	27	5
		High MA	39	48	6	7
		Young Normal*	6	59	19	26
		Low MA	19	44	14	23

TABLE 15 Continued

T-L Frequency	Stimulus	Group	Logical	Syntactic	Miscellaneous	Unscored
AA	Man	Old Normal	70	21	9	0
		High MA	78	10	10	1
		Young Normal*	35	23	31	11
		Low MA	67	12	17	5
AA	Salt	Old Normal	45	26	5	14
		High MA	54	37	7	2
		Young Normal*	49	31	11	9
		Low MA	41	23	24	11
AA	Table	Old Normal	33	18	40	9
		High MA	54	14	20	13
		Young Normal*	45	8	39	8
		Low MA	35	9	37	19

*Based on Entwhistle's (1966) data